US009162466B2

(12) **United States Patent**
Nagashima et al.

(10) **Patent No.: US 9,162,466 B2**
(45) **Date of Patent: Oct. 20, 2015**

(54) **LIQUID HOUSING BODY RECYCLING METHOD, AND LIQUID HOUSING CONTAINER**

(71) Applicant: **SEIKO EPSON CORPORATION**, Tokyo (JP)

(72) Inventors: **Takumi Nagashima**, Nagano (JP); **Taku Ishizawa**, Nagano (JP)

(73) Assignee: **Seiko Epson Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/504,661**

(22) Filed: **Oct. 2, 2014**

(65) **Prior Publication Data**

US 2015/0097902 A1 Apr. 9, 2015

(30) **Foreign Application Priority Data**

Oct. 7, 2013 (JP) 2013-209935

(51) **Int. Cl.**
B41J 2/175 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/17506*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/17563; B41J 2/175; B41J 2/17513; B41J 2/17556; B41J 2/17523; B41J 2202/07; B41J 2/17506; B41J 2/19
USPC 347/84–86, 92, 93
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,652,083 B2 * 11/2003 Ison et al. 347/93
2012/0050429 A1 * 3/2012 Kurobe 347/93

FOREIGN PATENT DOCUMENTS

JP 2004-358802 A 12/2004
JP 2011-148221 A 8/2011

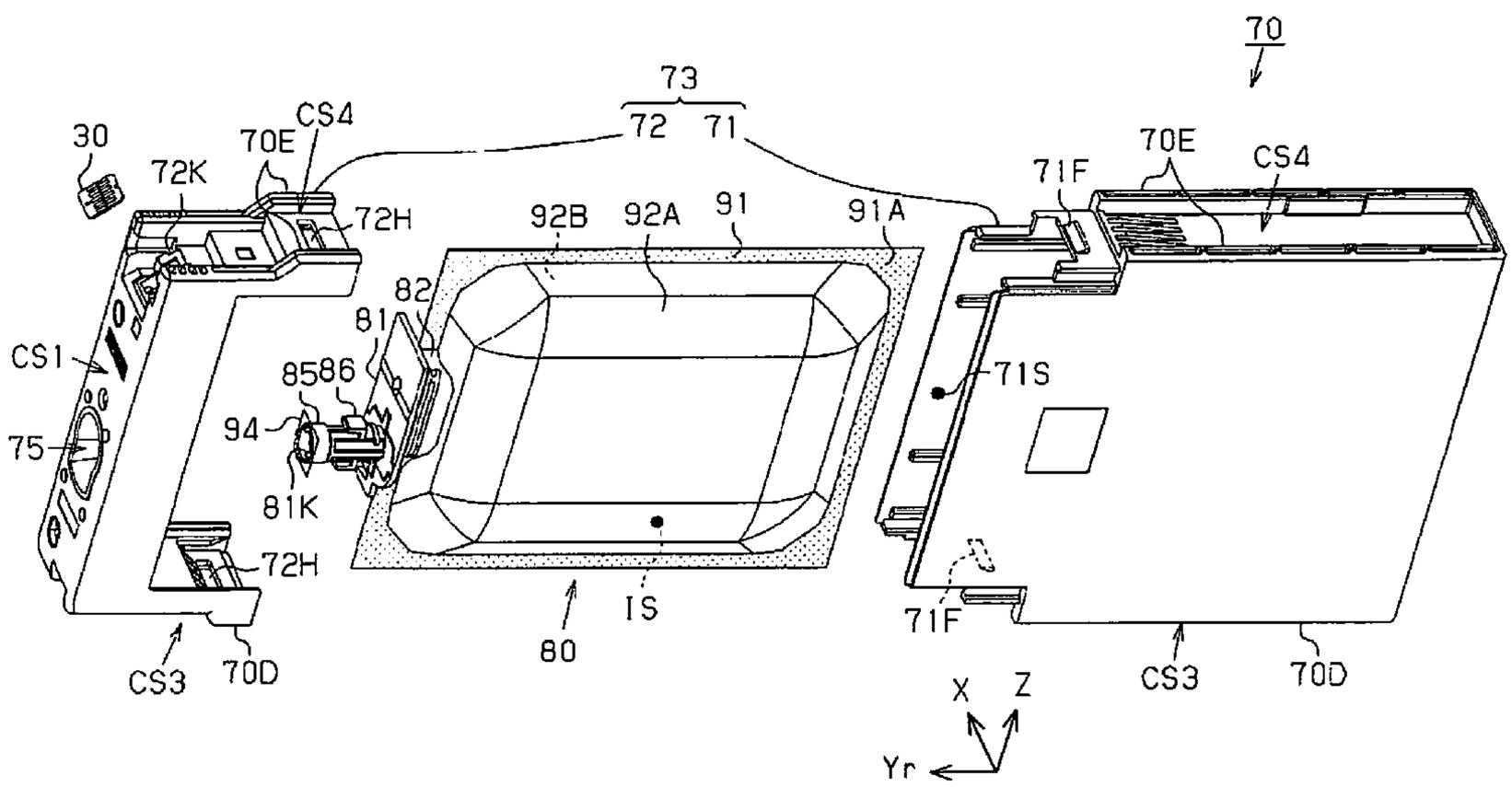
* cited by examiner

Primary Examiner — Thinh Nguyen
(74) *Attorney, Agent, or Firm* — Global IP Counselors, LLP

(57) **ABSTRACT**

A liquid housing body recycling method is provided for a liquid housing body that includes a liquid housing unit that is configured to house liquid, a supply member with a supply port that is configured to be connected to a liquid supply tube of a liquid consuming device, and a filter through which the liquid is configured to pass, with the liquid inside the liquid housing unit being supplied to the liquid consuming device via the supply port by passing through the filter. The liquid housing body recycling method includes forming an opening part on the liquid housing unit at a position outside an area facing opposite the filter on the liquid housing unit, injecting the liquid from the opening part of the liquid housing unit on which the opening part has been formed, and sealing the opening part.

6 Claims, 10 Drawing Sheets



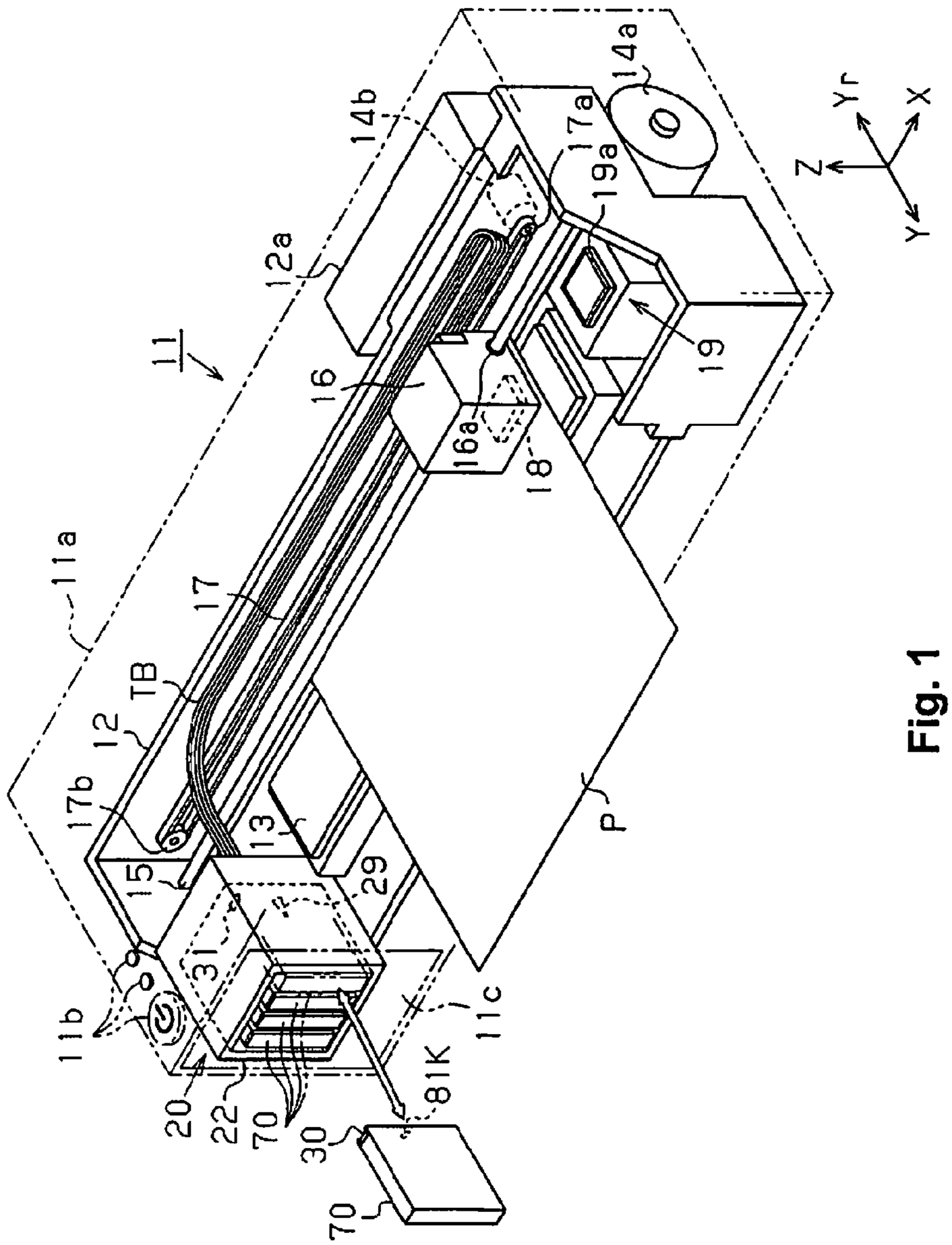

14b
14a
17a
19a
Yr
X
Z
Y
12a
11
16
19
16a
18
11a
17
TB
12
17b
13
15
29
P
31
11b
11c
81K
20
22
70
30
70

Fig. 1

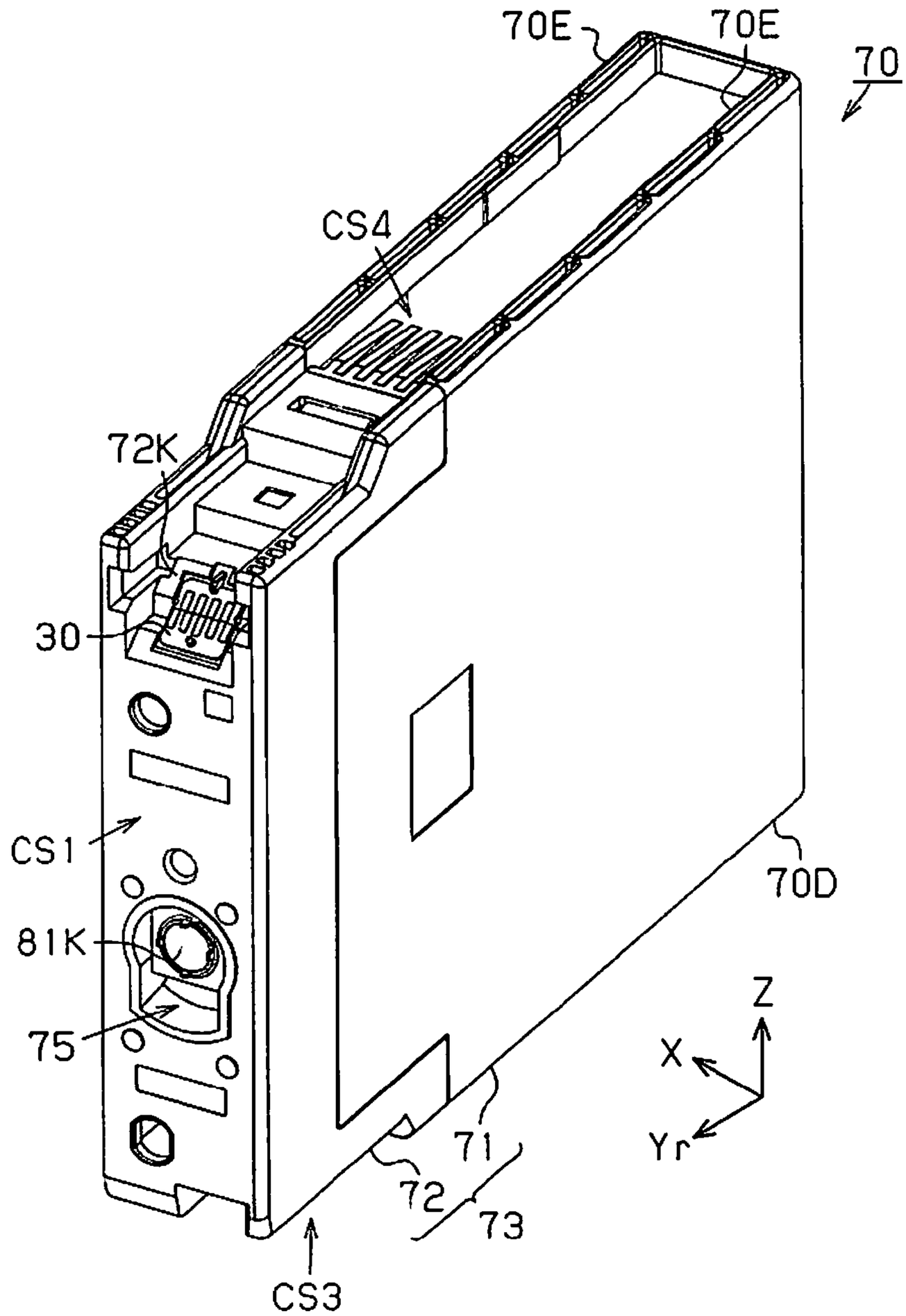


Fig. 2

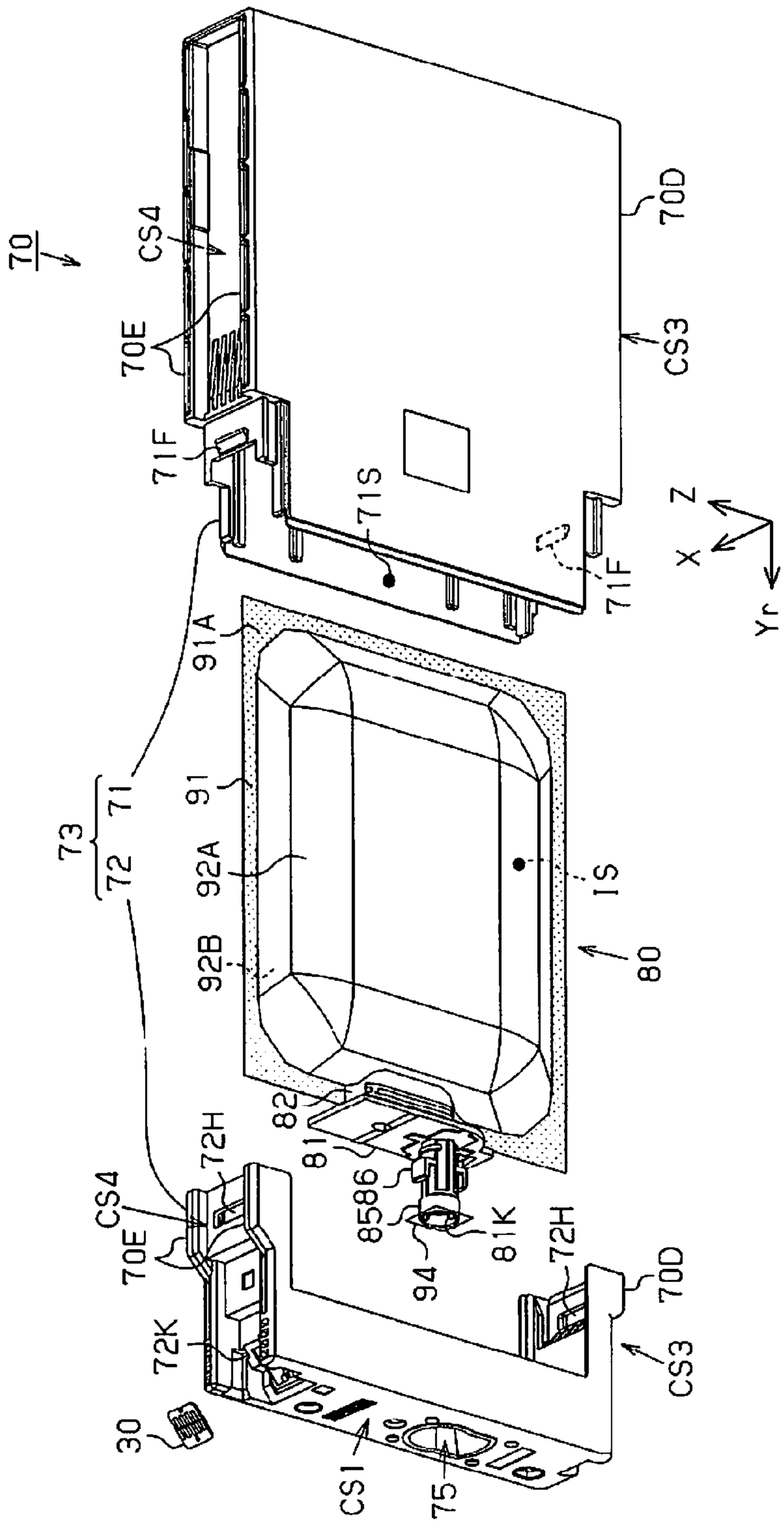

70
CS4
70D
70E
CS3
71F
71S
Z
X
Yr
71F
91A
73
72
71
91
92A
92B
IS
80
82
81
72H
8586
94
81K
72H
70E
CS4
72K
70D
CS3
30
CS1
75

Fig. 3

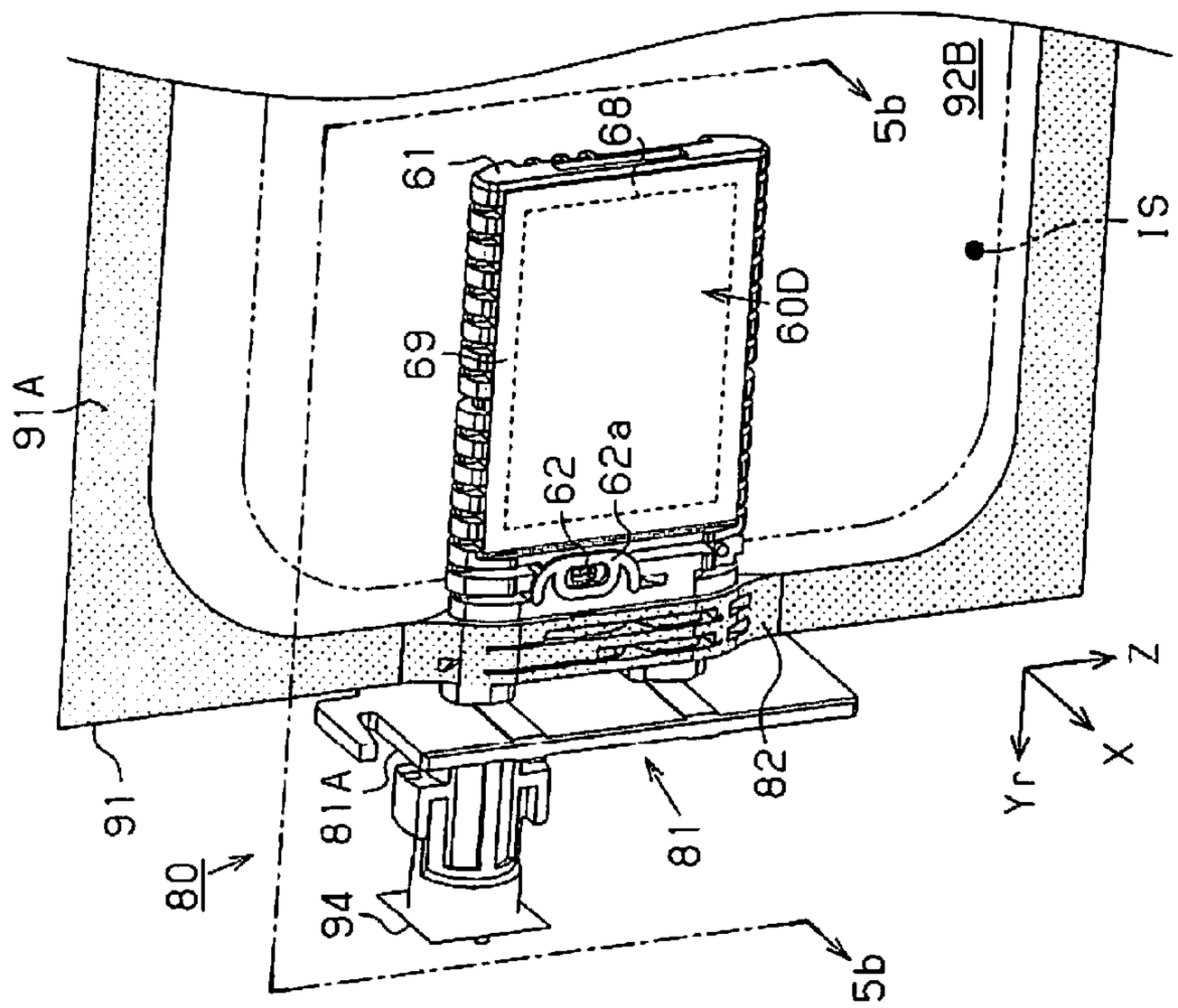

91A
91
80
94
81A
81
82
61
68
69
60D
62
62a
5b
92B
IS
Z
X
Yr

Fig. 4B

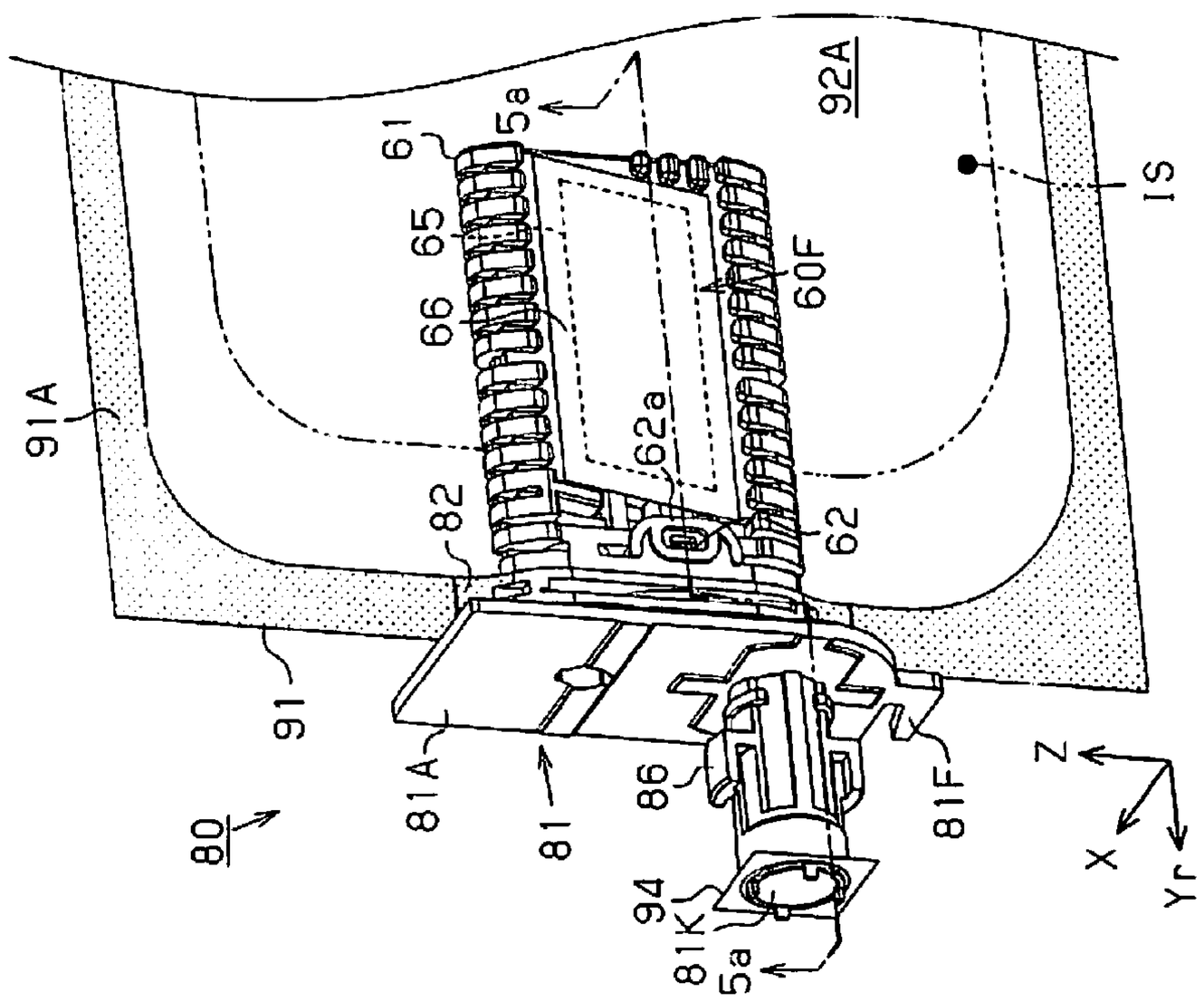

91A
91
80
94
81K
5a
81A
81
86
82
81F
61
65
66
62a
62
60F
5a
92A
IS
Z
X
Yr

Fig. 4A

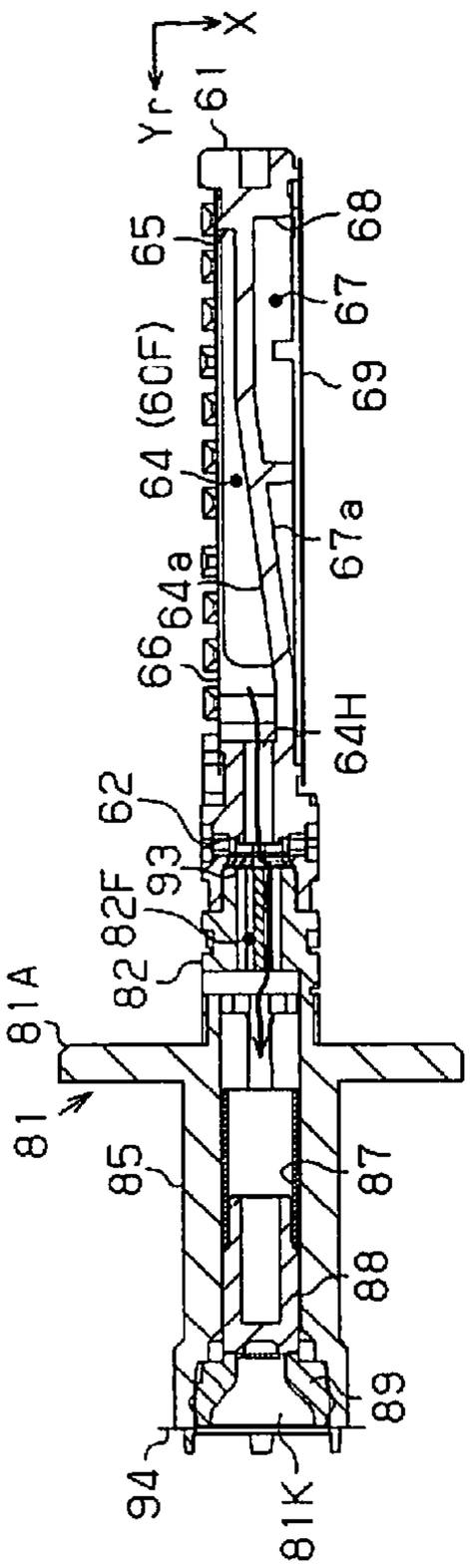

X
Yr
61
65
68
64 (60F)
67
69
67a
64a
66
64H
62
93
82F
82
81A
81
85
87
88
89
94
81K

Fig. 5A

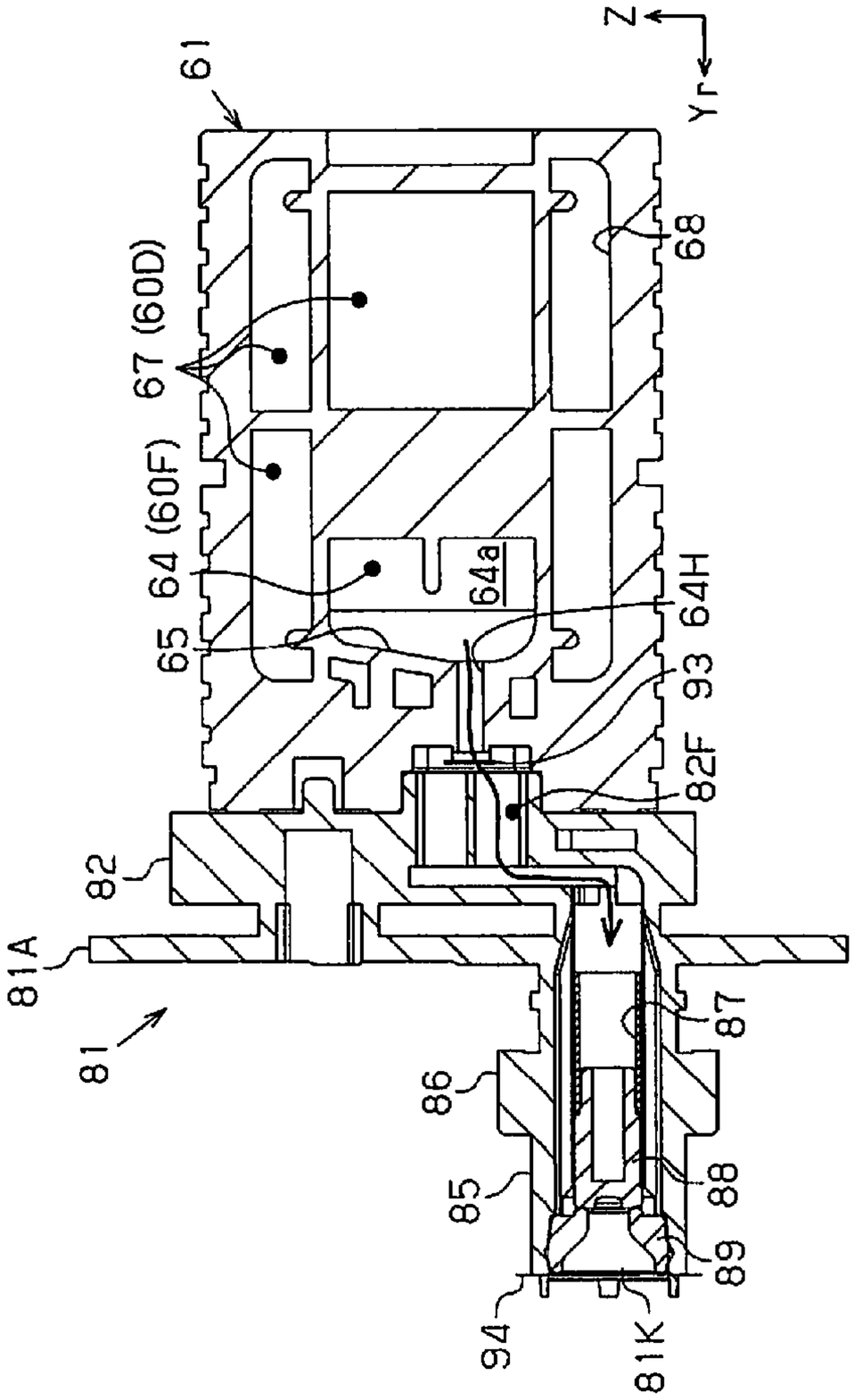

Z
Yr
61
68
67 (60D)
64 (60F)
64a
65
64H
93
82F
82
81A
81
87
86
85
88
89
94
81K

Fig. 5B

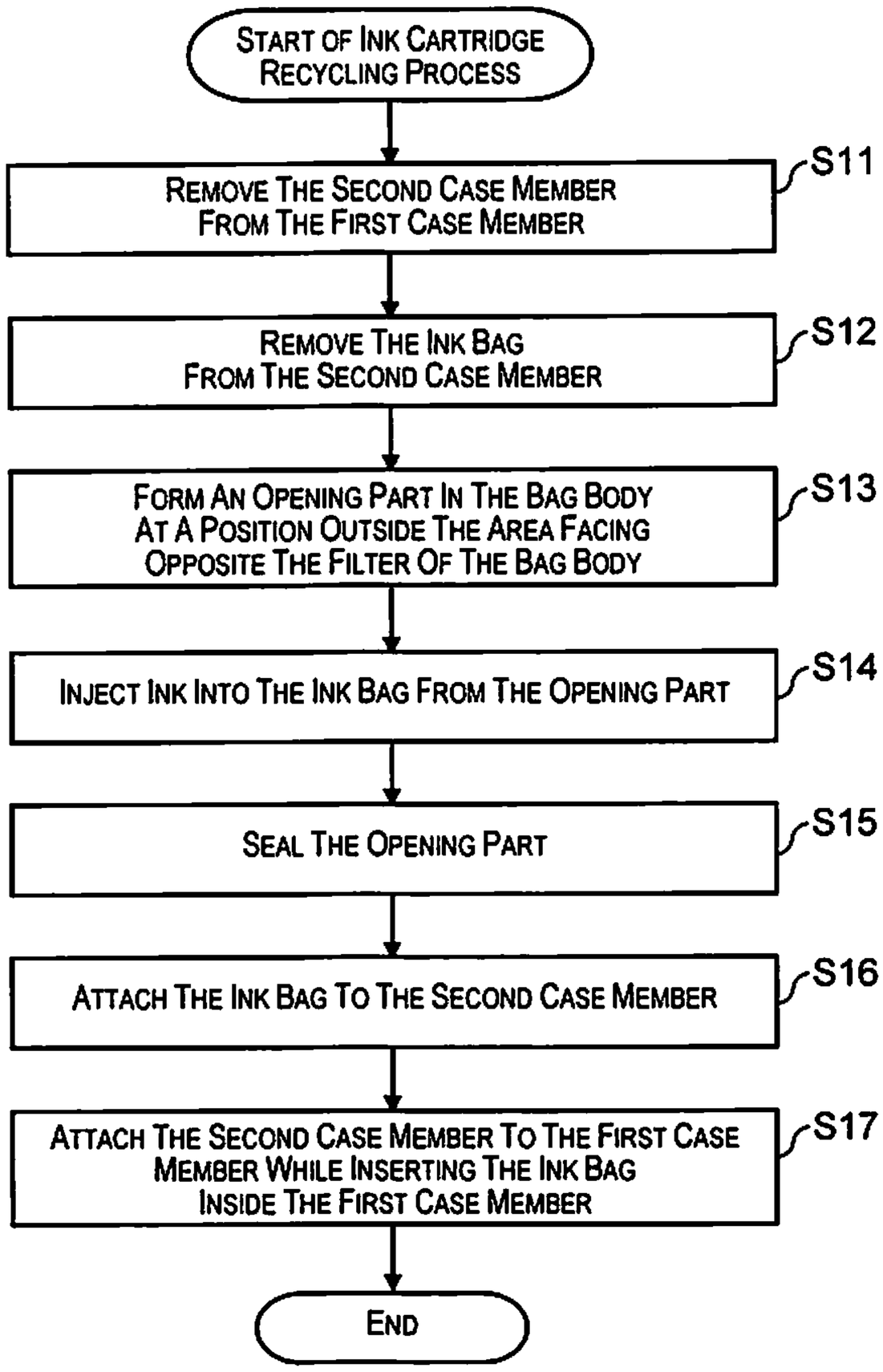

START OF INK CARTRIDGE RECYCLING PROCESS
REMOVE THE SECOND CASE MEMBER FROM THE FIRST CASE MEMBER
S11
REMOVE THE INK BAG FROM THE SECOND CASE MEMBER
S12
FORM AN OPENING PART IN THE BAG BODY AT A POSITION OUTSIDE THE AREA FACING OPPOSITE THE FILTER OF THE BAG BODY
S13
INJECT INK INTO THE INK BAG FROM THE OPENING PART
S14
SEAL THE OPENING PART
S15
ATTACH THE INK BAG TO THE SECOND CASE MEMBER
S16
ATTACH THE SECOND CASE MEMBER TO THE FIRST CASE MEMBER WHILE INSERTING THE INK BAG INSIDE THE FIRST CASE MEMBER
S17
END

Fig. 6

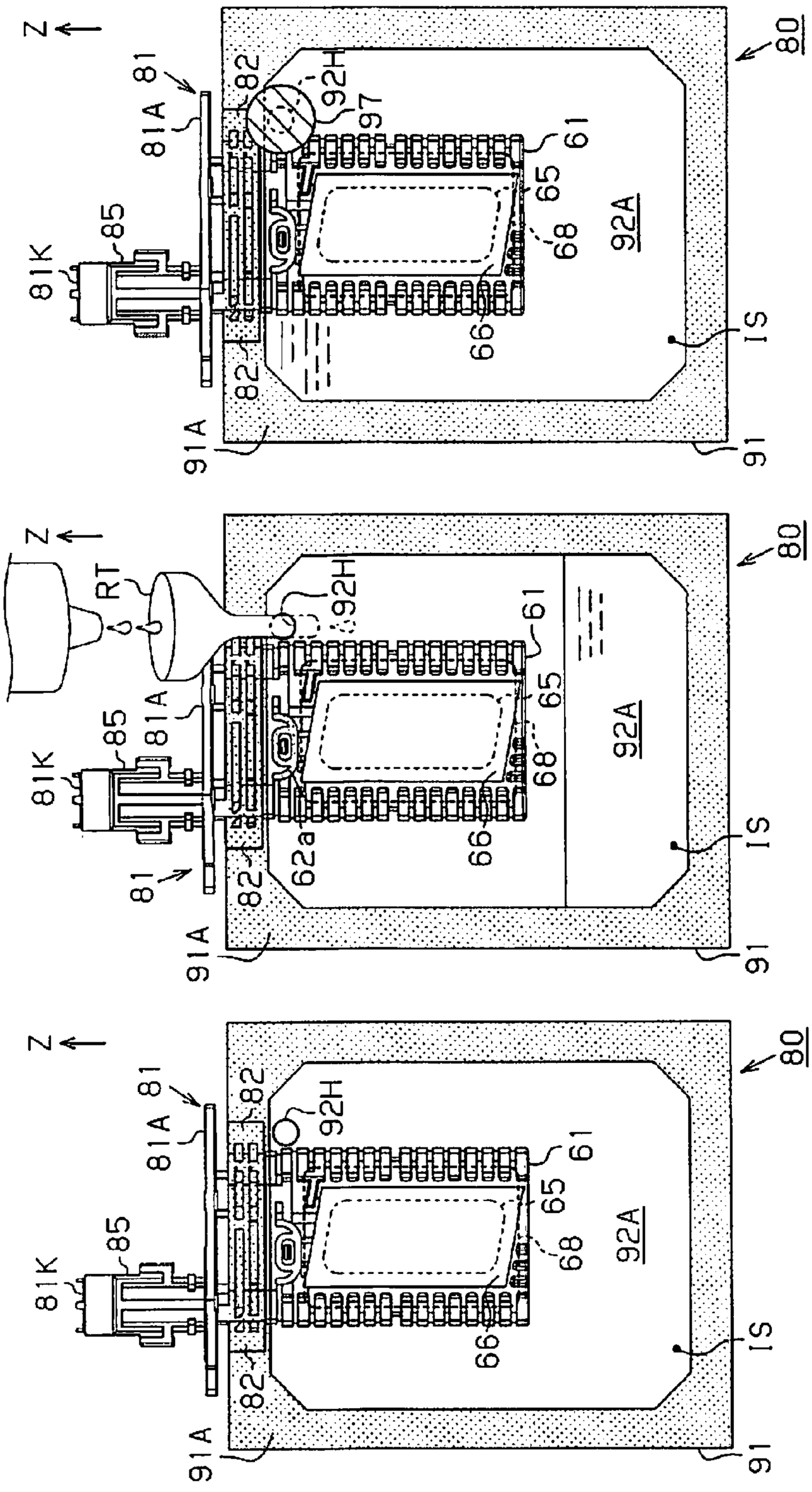


Fig. 7C

Fig. 7B

Fig. 7A

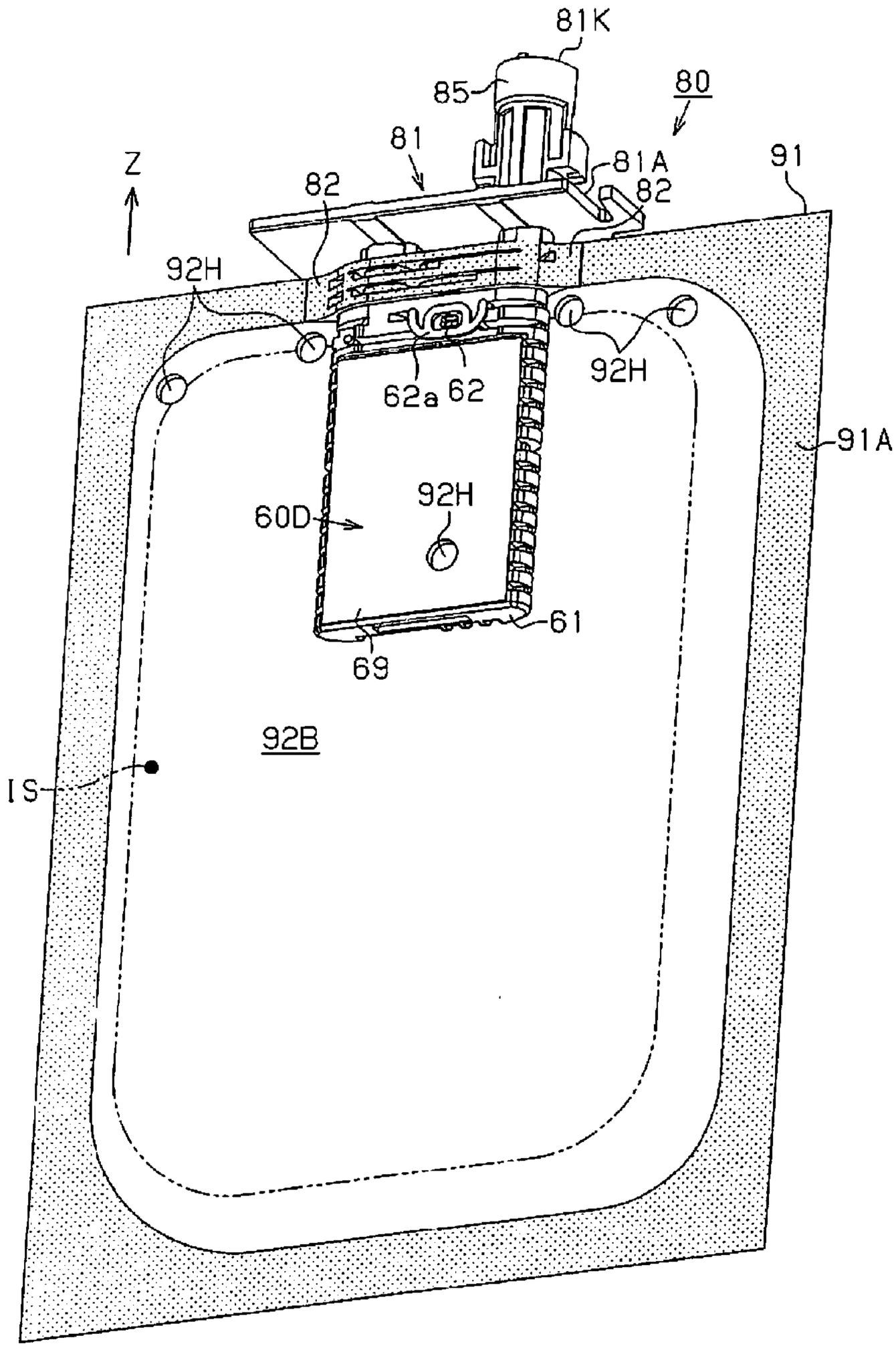


Fig. 8

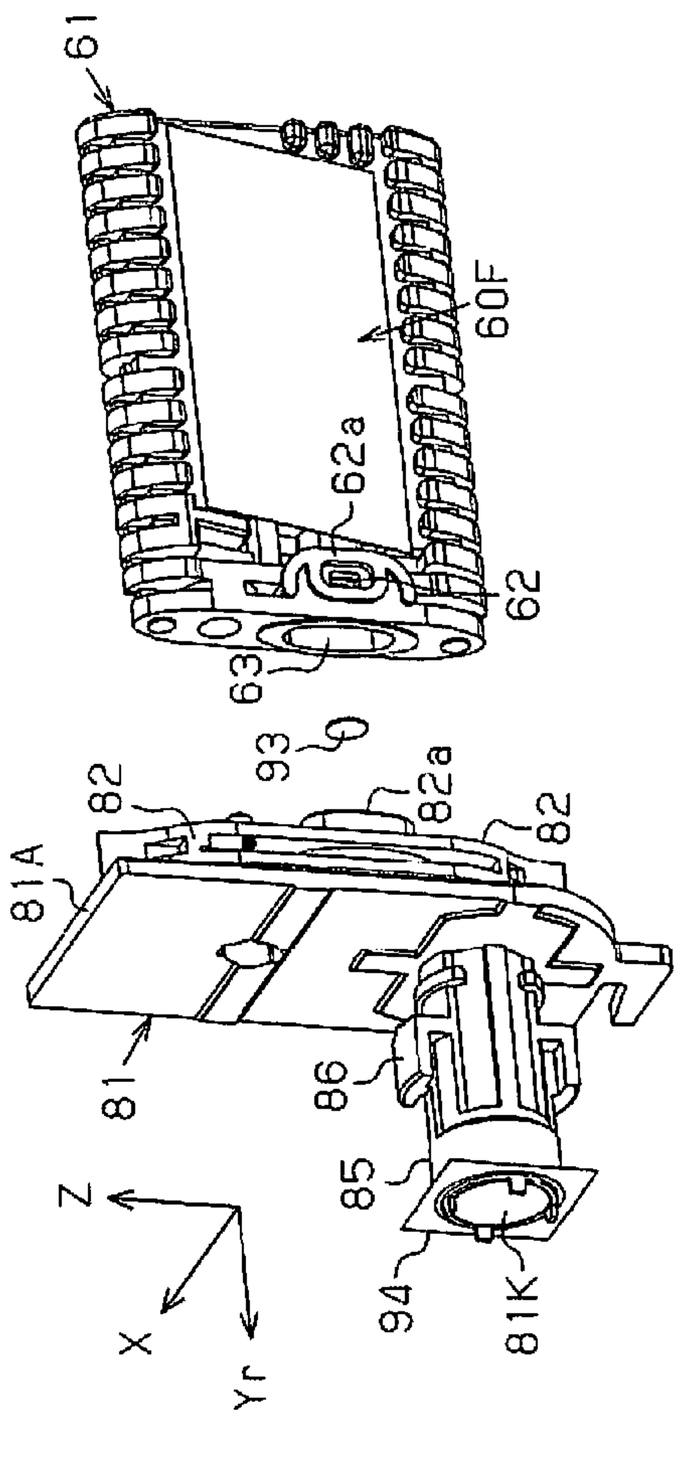

61
60F
62a
62
63
93
Q
82
82a
82
81A
81
86
85
94
81K
Z
X
Yr

Fig. 9A

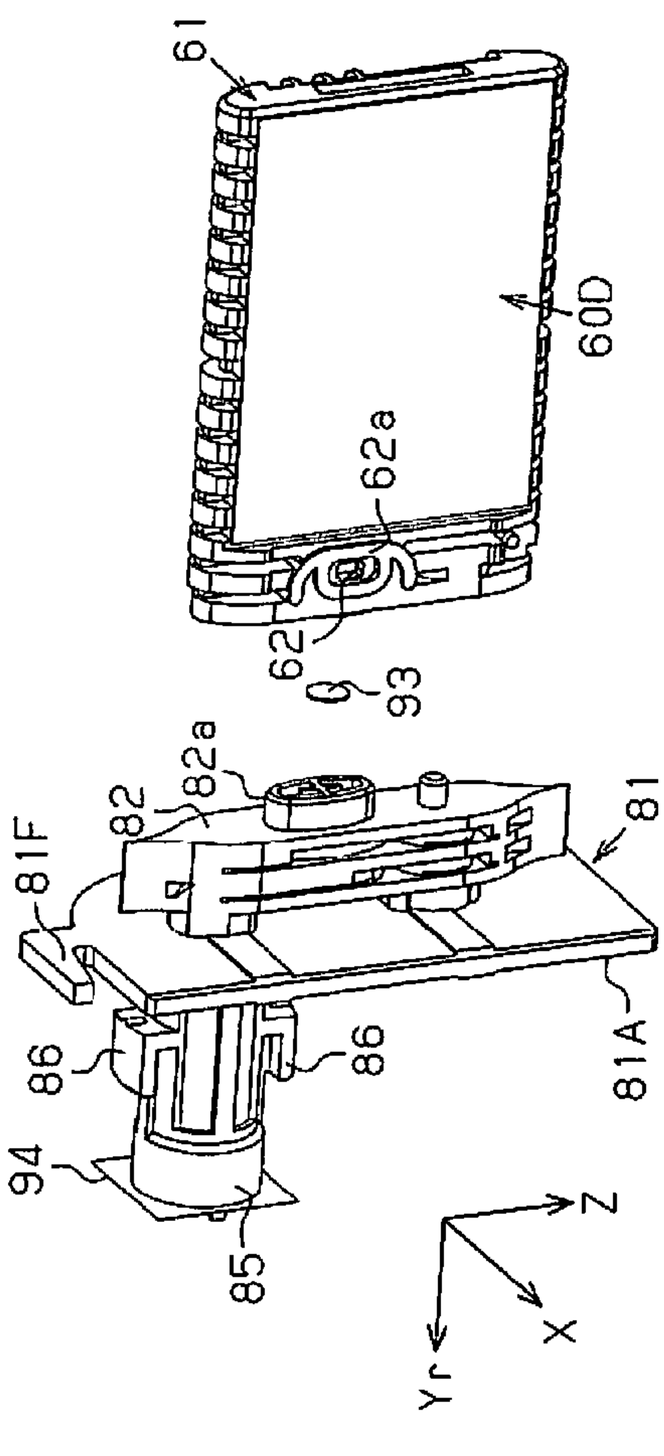

61
60D
62a
62
93
Q
82a
82
81F
81
86
86
81A
94
85
Z
X
Yr

Fig. 9B

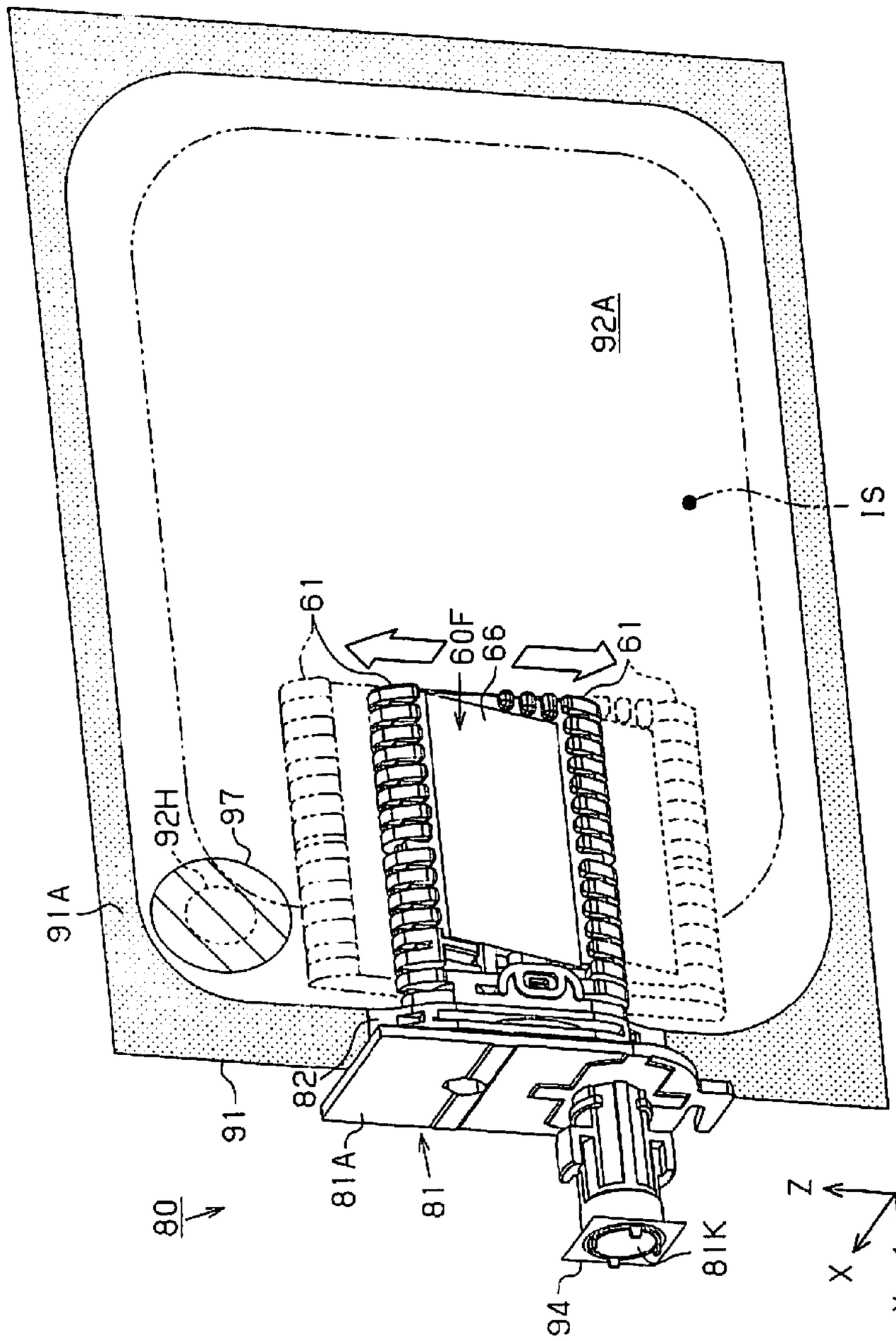


Fig.10

LIQUID HOUSING BODY RECYCLING METHOD, AND LIQUID HOUSING CONTAINER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to Japanese Patent Application No. 2013-209935 filed on Oct. 7, 2013. The entire disclosure of Japanese Patent Application No. 2013-209935 is hereby incorporated herein by reference.

BACKGROUND

1. Technical Field

The present invention relates to a liquid housing body recycling method for a liquid housing body capable of housing liquid, and to a liquid housing container.

2. Related Art

From the past, inkjet printers have been known as an example of a liquid consuming device that sprays and consumes a liquid (ink or the like). A liquid housing container (ink cartridge or the like) with a liquid housing body (ink bag or the like) having a liquid housing unit in which liquid is housed equipped inside a case member is mounted in this kind of printer, and liquid is supplied from the liquid housing container mounted in this way.

A supply port that flows out the liquid housed in the liquid housing unit is provided on a liquid housing body of this kind of liquid housing container. In a state with the liquid housing body housed inside the liquid housing container, this supply port is exposed inside the case member. Then, when the liquid housing container is mounted in a mounting unit of the printer, this supply port is connected to be able to supply liquid to a liquid supply tube (e.g., a supply needle) provided in the printer. Alternatively, there are also cases when the liquid is supplied to the liquid supply tube from the supply port by connecting the supply port and the liquid supply tube with a tube that is a liquid flow path.

Also known are liquid housing containers for which arranged inside the liquid housing unit is a filter that removes foreign matter from within the liquid flowed out from the supply port by the liquid passing through the inside of the liquid housing unit (see JP-A-2011-148221 (Patent Document 1), for example).

Furthermore, there have been proposals to recycle liquid housing containers for which supplying of liquid to the printer has become difficult due to the liquid inside the housing unit decreasing with supplying of liquid to the printer, by again injecting liquid inside the liquid housing unit of the liquid housing body housed inside that liquid housing container (see JP-A-2004-358802 (Patent Document 2), for example).

SUMMARY

However, with a liquid housing container equipped with a liquid housing body for which a filter is arranged inside a liquid housing unit, so that foreign matter is not included in the liquid supplied via a supply port, the liquid inside the liquid housing unit is flowed to the supply port after passing through a filter arranged inside the liquid housing unit. Because of this, when recycling the liquid housing body, it is important to make sure the filter is not damaged. However, there has not been proposed from the past a constitution for which liquid is injected without damaging the filter with a liquid housing body for which the filter is arranged inside the liquid housing unit.

This circumstance is generally common to a liquid housing container equipped with a liquid housing body for which a filter is arranged inside the liquid housing unit which is capable of housing liquid, when again injecting liquid into the liquid housing unit.

The present invention is conceived in light of these circumstances, and an advantage is to provide a liquid housing body recycling method with which it is possible to recycle the liquid housing body while suppressing damage to the filter, and a liquid housing container.

Following, we will note the means for solving the problems noted above, and the effects thereof.

The liquid housing body recycling method to address the problems noted above is a liquid housing body recycling method for a liquid housing body that includes a liquid housing unit that is configured to house liquid, a supply member with a supply port that is configured to be connected to a liquid supply tube of a liquid consuming device, and a filter through which the liquid is configured to pass, with the liquid inside the liquid housing unit being supplied to the liquid consuming device via the supply port by passing through the filter. The liquid housing body recycling method includes an opening forming step of forming an opening part on the liquid housing unit at a position outside an area facing opposite the filter on the liquid housing unit, an injection step of injecting the liquid from the opening part of the liquid housing unit on which the opening has been formed, and a sealing step of sealing the opening part.

With this method, the opening part for injecting liquid inside the liquid housing unit of the liquid housing body during recycling is formed outside the area facing the filter with the liquid housing unit, so it is possible to recycle the liquid housing body while suppressing damage to the filter that the liquid housing body has.

With the liquid housing body recycling method noted above, it is preferable that the liquid housing unit is formed of a sheet member, the filter is in sheet form, and in a state with the liquid not housed inside the liquid housing unit, a sheet surface of the filter is arranged inside the liquid housing unit in an orientation extending along a sheet surface of the liquid housing unit.

With this method, in a state when the liquid is not housed in the liquid housing unit, it is possible to easily confirm the area outside the area facing the filter with the liquid housing unit, specifically, the area for which it is possible to do opening forming of the opening part, so at the opening forming step, it is possible to form the opening part while having a high probability of suppressing damage to the filter.

With the liquid housing body recycling method noted above, it is preferable that the liquid housing body further includes a filter member to which the filter is adhered on one surface side and is disposed inside the liquid housing unit, the liquid housing unit have a first sheet member facing the filter adhered to the filter member, and a second sheet member that does not face the filter, and the first sheet member is arranged in parallel to the filter in a state with the liquid not housed inside the liquid housing unit.

With this method, it is easy to visually confirm the area for which opening formation of the opening part is possible outside the area facing the filter on the first sheet member, so with the opening forming step, it is possible to easily form the opening part while suppressing damage to the filter.

With the liquid housing body recycling method noted above, it is preferable that at the opening forming step, the forming of the opening part includes forming the opening part on the second sheet member.

With this method, at the opening forming step, the opening part is formed on the second sheet member that is not facing the filter, so damage to the filter accompanying opening formation is reliably suppressed.

With the liquid housing body recycling method noted above, it is preferable that the filter member is detachably attached to the supply member.

With this method, it is possible to set the opening position outside the area facing the filter with the liquid housing unit to a position suitable for injection of the liquid with the injection step.

The liquid housing container for solving the problems noted above includes a case member and a liquid housing body disposed inside the case member, the liquid housing body being recycled by the liquid housing body recycling method noted above.

With this constitution, by equipping the liquid housing body recycled while suppressing damage to the filter, it is possible to repeatedly supply liquid to the liquid consuming device from the same liquid housing container.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the attached drawings which form a part of this original disclosure:

FIG. **1** is a schematic perspective view showing an embodiment of a printer which is an example of a liquid consuming device;

FIG. **2** is a perspective view showing an ink cartridge mounted in a mounting unit of the printer;

FIG. **3** is an exploded perspective view showing the constitution of the ink cartridge;

FIGS. **4**A and **4**B are drawings showing an ink bag equipped inside the ink cartridge, where FIGS. **4**A and **4**B are perspective views seen in a state with the ink bag flipped over;

FIGS. **5**A and **5**B are drawings showing an ink supply flow path provided in the supply member, where FIG. **5**A is an arrow cross section view of line **5***a*-**5***a* in FIG. **4**A, and FIG. **5**B is an arrow cross section view of line **5***b*-**5***b* in FIG. **4**B;

FIG. **6** is a flow chart showing the ink cartridge recycling processing method;

FIGS. **7**A and **7**B are drawings showing the ink bag, where FIG. **7**A is a drawing of the state with the opening part provided in the bag body, FIG. **7**B is a drawing of the state with ink injected from the opening part, and FIG. **7**C is a drawing of the state with the opening part sealed after injection;

FIG. **8** is a perspective view of the ink bag formed on the bag body on the side for which the opening part does not face the filter;

FIGS. **9**A and **9**B are drawings showing the constitution for which it is possible for the filter member to be attached to the supply member, where FIGS. **9**A and **9**B are exploded perspective views of the supply member seen from mutually flipped directions; and

FIG. **10** is a perspective view showing the ink bag for which the position of the filter can be changed.

DETAILED DESCRIPTION OF EMBODIMENTS

Hereafter, we will describe an embodiment of an inkjet printer which is an example of a liquid consuming device while referring to the drawings. The printer of this embodiment performs printing on a paper P by spraying, specifically, consuming, ink which in an example of a liquid on a paper P conveyed in one direction to form an image.

As shown in FIG. **1**, the printer **11** of this embodiment is equipped with a case **11***a* having a roughly rectangular solid shape, a portion of which is shown by a double dot-dash line, and on the top surface of the antigravity direction Z side in the vertical direction, provided is an operating button **11***b* such as a power button or the like for driving the printer **11**, and a display unit (not illustrated). Also, an open and closeable cover **11***c* is provided on the front surface of the case **11***a* which is the conveyance direction Y side in which the paper P is conveyed. In a state with this cover **11***c* open, it is possible for the user to attach and detach and replace an ink cartridge **70**.

At the bottom part that becomes the gravity direction side inside a frame **12** forming a roughly rectangular box shape housed in an internal space covered by this case **11***a*, a support base **13** which has the direction orthogonal to the paper P conveyance direction Y as the lengthwise direction is provided extending in roughly the horizontal direction, and a paper feed motor **14***a* is provided on the bottom part of the rear side which is the side opposite to the conveyance direction Y. Specifically, through driving of this paper feed motor **14***a*, using a paper feed mechanism (not illustrated), the paper P is fed facing from that rear side to the front side on the support base **13**.

Also, upward, which becomes the antigravity direction side of the support base **13** inside the frame **12**, a guide shaft **15** is stretched across along the lengthwise direction of the support base **13**. A carriage **16** is supported so as to be able to move back and forth in the axis line direction on this guide shaft **15**. More specifically, a support hole **16***a* that pierces through in the lateral direction is formed on the carriage **16**, and the guide shaft **15** is inserted through this support hole **16***a*.

A driving pulley **17***a* and a driven pulley **17***b* are respectively supported to be able to rotate freely at positions near both ends of the guide shaft **15** noted above on the back wall inner surface of the frame **12**. An output shaft of a carriage motor **14***b* is coupled to the driving pulley **17***a*, and a seamless timing belt **17** for which a portion is coupled to the carriage **16** is wound between the driving pulley **17***a* and the driven pulley **17***b*. Also, by the carriage motor **14***b* being driven, while the carriage **16** is guided by the guide shaft **15** via the timing belt **17**, it moves back and forth in the lengthwise direction, specifically, along the scanning direction ±X. A liquid spray head **18** which is an example of a liquid spray unit is provided on the bottom side of this carriage **16**, and the ink supplied to this liquid spray head **18** is sprayed from the liquid spray head **18** and consumed, and an image is printed on the paper P.

Inside the case **11***a*, at the left side of the scanning direction X seen from the front side, arranged is a mounting unit **20** for which an ink cartridge **70** which is an example of a liquid housing container is mounted so as to be able to be inserted and removed. An ink supply tube TB capable of flowing ink is coupled between the mounting unit **20** and the carriage **16**. The ink inside the ink cartridge **70** is supplied to the liquid spray head **18** via this ink supply tube TB.

With this embodiment, the mounting unit **20** has a box shaped cartridge holding body **22** for which the front side is opened. Four roughly rectangular solid ink cartridges **70** are constituted to be able to be mounted aligned along the scanning direction X inside the cartridge holding body **22**. Housed in the four ink cartridges **70**, for example, are mutually different colors of cyan, magenta, yellow, and black ink. Because of this, on each mounting unit **20** are also equipped

four supply needles **29** corresponding to each ink cartridge **70** which are examples of a liquid supply tube. Each ink cartridge **70** can be inserted and removed as shown by the white outline arrow in the mounting unit **20** inside the case **11***a* in a state with the cover **11***c* opened.

Also, by the supply needle **29** being provided in the inner wall of the cartridge holding body **22** of the Yr tip side of the insertion direction of the ink cartridge **70**, and the supply port **81**K of the inserted ink cartridge **70** and the supply needle **29** being connected, ink is supplied from the ink cartridge **70**. Also, the ink supplied to the supply needle **29** is sent to the liquid spray head **18** via the ink supply tube TB from the ink flow path formed on the mounting unit **20** by the operation of a pump (not illustrated) (e.g., a diaphragm pump) equipped in the mounting unit **20**. With this embodiment, the insertion direction Yr of the ink cartridge **70** is the opposite direction to the conveyance direction Y of the paper P.

Meanwhile, in the area further to the scanning direction X right side seen from the front side than the support base **13** in the frame **12** interior, specifically, the home position area that is not used during printing, provided is a maintenance device **19** having a box shaped cap with a bottom **19***a* that is opened upward and a suction pump or the like (not illustrated). Also, with the printer **11**, after the carriage **16** is moved to the home position area, with this maintenance device **19**, a maintenance operation is performed that does maintenance so that ink is sprayed stably from the liquid spray head **18**.

The various operations performed by this kind of printer **11** are controlled by a control unit. With this embodiment, the control unit is constituted by a circuit substrate on which are mounted electrical components such as a CPU, RAM, ROM or the like, and for example is arranged inside a case **12***a* equipped to the rear of the frame **12**.

Furthermore, when ink is supplied from the ink cartridge **70**, the control unit performs communication of designated cartridge information (e.g., data such as ink cartridge **70** identification data or the remaining volume of ink inside the ink cartridge **70** or the like) with memory (not illustrated) which is an example of a storage device equipped in the ink cartridge **70**. The cartridge information is updated as appropriate by the control unit. Also, the ink remaining volume data is displayed on a display unit of the case **11***a* as necessary.

This cartridge information communication is specifically performed by an electrical connection between an electrical connection part **31** constituted by terminals or the like equipped in the cartridge holding body **22**, and an electrical connection part **30** constituted by a circuit substrate having terminals equipped in the ink cartridge **70**. Therefore, four electrical connection parts **31** are equipped according to the number of ink cartridges **70** in the mounting unit **20**. In FIG. **1**, only one electrical connection part **31** is illustrated.

As shown in FIG. **2**, the ink cartridge **70** of this embodiment has a first case member **71** on the rear side opposite to the lead side of the insertion direction Yr, and a second case member **72** on the lead side of the insertion direction Yr. Also, the supply port **81**K of the ink bag **80** is exposed on the concave shaped part **75** provided on the front side surface CS**1** of the lead side, specifically, the front side surface CS**1** of the second case member **72** during insertion of the ink cartridge **70**. Also, an inclined plane **72**K is provided on the top end part of the front side surface CS**1** on the second case member **72**, and the electrical connection part **30** is attached to this inclined plane **72**K.

With this embodiment, with the mounting unit **20**, a guide rib (not illustrated) is provided at a position corresponding to the inserted ink cartridge **70**, and the ink cartridge **70** is inserted while being guided by the guide rib of the mounting unit **20**. Specifically, on the top side surface CS**4** and the bottom side surface CS**3** of the ink cartridge **70**, respectively formed are an upper convex part **70**E and a lower convex part **70**D that extend along the insertion direction Yr at both end parts in the width direction. By this upper convex part **70**E and lower convex part **70**D being moved while being aligned by respectively abutting the guide ribs provided on the mounting unit **20** in the scanning direction X, the ink cartridges **70** are inserted in set positions with the mounting unit **20**. As a result, the supply port **81**K is suppressed from having positional skew in relation to the supply needle **29**, and is made to be suitably connected to the supply needle **29**. Also, the electrical connection part **30** is suppressed from having positional skew in relation to the electrical connection part **31**, and is made to be suitably connected to the electrical connection part **31**.

Next, we will describe the internal constitution of the ink cartridge **70**.

As shown in FIG. **3**, the ink cartridge **70** has the ink bag **80** as the liquid housing body housed inside the case member **73** for which the two members of the first case member **71** and the second case member **72** are combined. The X, Yr, and Z directions shown in FIG. **3** are the same as the X, Yr, and Z directions of FIG. **1** with the orientation of the ink cartridge **70** mounted in the printer **11**.

The first case member **71** has roughly a box shape having an opening area **71**S in which the ink bag **80** can be inserted and removed, and roughly triangular prism shaped projecting parts **71**F are respectively formed on the bottom side surface CS**3** and the top side surface CS**4**. Meanwhile, on the second case member **72**, roughly rectangular hole parts **72**H in which the projecting part **71**F can be inserted are respectively formed on the bottom side surface CS**3** and top side surface CS**4**. Also, as the second case member **72** is moved so as to cover that opening area **71**S on that first case member **71**, by the projecting part **71**F of the first case member **71** being fit from the inside in the hole part **72**H of the second case member **72**, the second case member **72** is attached to the first case member **71**. Conversely, by pulling the second case member **72** so as to pull away from the first case member **71**, the projecting part **71**F is taken out from the hole part **72**H, and the second case member **72** is removed from the first case member **71**.

The ink bag **80** has the opening side of a bag shaped bag body **91** which is an example of the liquid housing unit joined to a junction part **82** of the supply member **81** which has the supply port **81**K. Its interior is an ink chamber IS (liquid housing unit) in which ink can be housed. With this embodiment, the bag body **91** is formed using a flexible sheet member, and two sheet form bag members **92**A and **92**B are first formed into a bag shape with three of the four outer edges adhered. Next, in a state with the junction part **82** of the supply member **81** inserted in the bag opening side formed by the one side that is not adhered, by adhering at one side together with the supply member **81**, an adhered part **91**A is formed around the periphery of the bag body **91** shown by the shaded area in FIG. **3**, and the interior of the bag body **91** is used as the ink chamber IS. Then, the flexible bag body **91** is deformed so as to decrease the gap between the two bag members **92**A and **92**B facing opposite as the capacity of the ink chamber IS decreased due to an outflow of ink.

With this embodiment, the constitution is such that the supply member **81** having the supply port **81**K, specifically, the supply member **81** in which the supply port **81**K is provided, is attached to the second case member **72** by rotating relative to the second case member **72**. The supply member **81** has a tube shaped flow path part **85** provided that is in com-

munication with the supply port **81**K. A pair of parts to be engaged **86** project from the tube shaped flow path part **85**. Also, the constitution is such that after the tube shaped flow path part **85** is inserted into a hole (not illustrated) provided in the concave shaped part **75** of the second case member **72**, by rotating with its axis line as the center, this is fixed by the part to be engaged **86** provided in the tube shaped flow path part **85** and the concave shaped part **75** as the engaging part provided in the second case member **72** being engaged. By the tube shaped flow path part **85** being fixed to the concave shaped part **75** in this way, the ink bag **80** is attached to the second case member **72**.

Next, we will describe the member constitution of the ink bag **80**.

As shown in FIGS. **4**A and **4**B, the ink bag **80** is equipped with the supply member **81** in which the supply port **81**K is provided, and a filter chamber **60**F and a de-aerating chamber **60**D inside the ink chamber IS inside the bag body **91** joined to the junction part **82** of this supply member **81**. The X, Yr, and Z axis directions of FIGS. **4**A and **4**B are the same as the X, Yr, and Z axes of FIG. **1** in the orientation with the ink cartridge **70** mounted on the printer. Also, FIG. **4**B shows the ink bag **80** of FIG. **4**A in an inverted state. Also, with FIGS. **4**A and **4**B, the bag body **91** is shown in a transparent state.

With this embodiment, two spaces for which one end is respectively opened are formed on a connecting member **61** connected to the supply member **81**. Also, so as to close a first opening **65** and a second opening **68** which become the openings of the respective spaces, a filter **66** through which ink can pass and a film **69** through which gas can be transmitted are respectively adhered, and a filter **60**F and a de-aerating chamber **60**D are formed. Therefore, the connecting member **61** is also the filter member to which the filter **66** has been adhered.

The filter **66** and the film **69** are arranged at mutually overlapping positions seen from the width direction of the ink cartridge **70** which is the scanning direction X in a state with the ink cartridge **70** mounted on the mounting unit **20**, in other words, at positions for which they have a front and back relationship to each other with the connecting member **61**. Also, the bag member **92**A is positioned at the side facing the filter **66**, and the bag member **92**B is positioned at the side facing the film **69**. Also, the filter **66** is in sheet form, and its sheet surface is positioned in an orientation in a direction along the sheet surface of the bag member **92**A in a state for which ink is not housed inside the bag body **91**, either before ink is housed, or after the housed ink is flowed out. Meanwhile, the film surface of the film **69** is arranged in an orientation in the direction along the sheet surface of the bag member **92**B in a state for which the ink is not housed inside the bag body **91**, in the same manner, either before the ink is housed, or after the housed ink is flowed out.

Therefore, the area for which the filter **66** and the bag member **92**A overlap in a state with the housed ink consumed during manufacturing of the ink cartridge **70**, and the capacity of the ink chamber IS is reduced so that ink is not housed inside the bag body **91**, is an area for which the filter **66** and the bag body **91** face opposite each other. Similarly, the area for which the film **69** and the bag member **92**B face opposite is an area where they overlap each other. Also, at least the bag member **92**A as the first sheet member has its sheet surface parallel to the sheet surface of the filter **66** in a state in which ink is not housed inside the bag body **91**. Therefore, with the bag member **92**A, the area overlapping the filter **66** can be easily visually confirmed. Parallel as mentioned here includes a slight angle difference due to deformation, bending or the like of the bag member **92**A, for example.

Also, with this embodiment, in a state for which ink is not housed inside the bag body **91** after housed ink is flowed out, the bag member **92**A is deformed to the degree that it is possible to distinguish the outline shape of the connecting member **61**. Also, the bag member **92**B is also deformed to the level that it is possible to distinguish the outline shape of the connecting member **61**.

Also, an injection port **62** for when first injecting ink into the ink chamber IS is provided on the connecting member **61**, and after ink is injected, the injection port **62** is sealed so as to block communication with the ink chamber IS by joining (adhering) bag members **92**A and **92**B on a ring shaped rib **62***a* provided so as to enclose this injection port **62**.

Next, we will describe the supply member **81** and the connecting member **61** while referring to FIGS. **4**A and **4**B and FIGS. **5**A and **5**B. With FIGS. **5**A and **5**B, the bag body **91** is omitted, and the supply member **81** and the connecting member **61** are illustrated. Also, the X, Yr, and Z axis directions of FIGS. **5**A and **5**B are the same as the X, Yr, and Z axes of FIG. **1** in an orientation with the ink cartridge **70** mounted in the printer.

As shown in FIGS. **5**A and **5**B, the connecting member **61** of this embodiment is attached to the supply member **81** by adhering or fitting while sandwiching a valve body **93** (non-return valve), and becomes an integral unit with the supply member **81**. Also, the part adjacent to the connecting member **61** of the supply member **81** is the junction part **82** for which the bag body **91** is joined by adhesion or the like as shown in FIG. **4**B. The connecting member **61** has an outline that is roughly a rectangular solid shape.

Also, as shown in FIG. **4**A, the supply member **81** has a main unit **81**A that is roughly a rectangular plate shape on the insertion direction Yr side to the mounting unit **20** with this junction part **82**. One end of the lengthwise direction of the main unit **81**A is rectangular whereas the other end has a roughly L shaped L part **81**F formed. The tube shaped flow path part **85** is provided projecting at a position toward the edge of the L part **81**F of the main unit **81**A on the main unit **81**A of the supply member **81**.

A first recess area **64** having a first opening **65** that is roughly parallelogram shaped is provided on the connecting member **61**. Also, so as to close the first opening **65** of this first recess area **64**, by the filter **66** for suppressing passing through (transmission) of foreign matter other than ink so as to allow passing through of ink by transmitting it being adhered to the connecting member **61**, the filter chamber **60**F is formed.

Also, an inclined plane **64***a* with the tip downward facing the supply member **81** side is formed on the bottom surface of the first recess area **64** in the filter chamber **60**F. Also, an ink outflow port **64**H for flowing out ink that has passed through the filter **66** to the supply member **81** from the connecting member **61** is provided on the supply member **81** side of the first recess area **64**. Therefore, the ink housed in the ink chamber IS is flowed into the filter chamber **60**F after passing through the filter **66**, and is further flowed via the ink outflow port **64**H to the supply port **81**K positioned at the tip of the tube shaped flow path part **85** provided on the supply member **81**.

Specifically, as shown by the solid line arrow in FIGS. **5**A and **5**B, the ink that flows into the filter chamber **60**F after passing through the filter **66** from the ink chamber IS, after flowing into the ink outflow port **64**H, passes through the valve body **93** and flows in the supply flow path **82**F provided in the supply member **81**, and flows inside the tube shaped flow path part **85** in communication with this supply flow path **82**F. In this way, the ink inside the ink chamber IS is led up to the supply port **81**K via the supply flow path **82**F formed on

the supply member **81** after passing through the filter **66**. The valve body **93** allows the flow of ink from the ink chamber IS side to the supply port **81**K side, and functions as a non-return valve restricting backflow of ink from the supply port **81**K side to the ink chamber IS side.

On the tube shaped flow path part **85**, as shown in FIGS. **5**A and **5**B, in sequence from the supply port **81**K side, a supply port spring **87**, a supply port spring seat **88**, and a supply port sealing rubber **89** are inserted, and finally, the supply port film **94** is joined by adhesion or the like to the tip of the tube shaped flow path part **85**. By this joining of the supply port film **94**, the supply port **81**K is in a sealed state. Then, the supply port film **94** seal is broken by the supply needle **29** being inserted in the supply port **81**K formed at the tip of the tube shaped flow path part **85**, and the supply port spring seat **88** that was abutting the supply port sealing rubber **89** and blocking the ink flow path is pushed in so as to separate from the supply port sealing rubber **89**. As a result, at the supply port **81**K, a gap is formed for which ink can flow by inserting the supply needle **29**, and ink flows into the supply needle **29** that was inserted from the formed gap.

Also, with this embodiment, the first recess area **64** that becomes the filter chamber **60**F and the filter **66** are arranged in overlapping positions with the supply port **81**K seen from the axis line direction of the tube shaped flow path part **85** on the connecting member **61**.

Furthermore, with this embodiment, on the connecting member **61**, a second recess area **67** having the roughly rectangular second opening **68** on the side opposite the first opening **65** is provided so as to overlap the first recess area **64**. On this second recess area **67**, an inclined plane **67***a* with the tip upward approaching the second opening **68** facing the supply member **81** side is provided at a position almost overlapping the inclined plane **64***a* of the first recess area **64**. Also, the film **69** through which gas that was dissolved in the ink or air bubbles generated in the ink can pass is adhered to the connecting member **61** so as to close the second opening **68** in a reduced pressure atmosphere, and the second recess area **67** is a sealed space having lower pressure than atmospheric pressure. In this way, the second recess area **67** constitutes the de-aerating chamber **60**D.

Next, while referring to FIG. **6**, we will describe the action of recycling by re-injecting ink into the ink bag **80** with the ink cartridge **70** of this embodiment, specifically, the ink cartridge recycling process. This process is performed on ink cartridges **70** determined to have run out of ink based on the cartridge information of the ink cartridge **70**. For example, it may be performed by the collector who collected the ink cartridge **70** that ran out of ink. The collector can also be the printer manufacturer.

As shown in FIG. **6**, with this process of recycling ink bag cartridges, first, at step S**11**, the process of removing the second case member **72** from the first case member **71** is performed. The collector takes out the ink cartridge **70** subject to recycling from the mounting unit **20** of the printer **11**, and then pulls out and removes the second case member **72** from the first case member **71**. At this time, with this embodiment, the ink bag **80** is attached to the second case member **72**, so as the second case member **72** is being pulled out, the ink bag **80** is being taken out from the opening area **71**S of the first case member **71**.

Next, at step S**12**, the process of removing the ink bag from the second case member **72** is performed. In specific terms, the engagement of the part to be engaged **86** formed on the tube shaped flow path part **85** of the ink bag **80** and the concave shaped part **75** is released by rotating the ink bag **80** in relation to the second case member **72**, for example, and the ink bag **80** is removed from the second case member **72**.

Next, at step S**13**, processing is performed to form the opening part **92**H on the bag body **91** (opening forming step) at the position outside the area facing the filter **66** of the bag body **91**. Subsequently, at step S**14**, the process is performed of injecting ink from the formed opening part **92**H into the ink bag **80** (bag body **91**) (injection step). Then, at the next step S**15**, the process of sealing the opening part **92**H is performed (sealing step).

FIGS. **7**A to **7**C show examples of the processes from step S**13** to step S**15**.

As shown in FIG. **7**A, with this embodiment, so that ink does not leak from the supply port **81**K for which the supply port film **94** has been torn during injection of the ink, the ink bag **80** is in a state for which the supply port **81**K faces the antigravity direction Z side. Also, with the bag member **92**A, at the ink chamber IS antigravity direction Z side end part, at a position outside the area for which there is overlap with the filter **66** assumed from the deformation status (opposite facing area), the opening part **92**H having a designated diameter dimension is formed at a position near the connecting member **61**. Specifically, with the bag body **91** in a state for which the housed ink has decreased, there is a high probability that a structural gap will be formed between the bag member **92**A and the bag member **92**B positioned near the connecting member **61**. Therefore, when forming the opening part **92**H at a position near the connecting member **61** in this way, for example when opening a hole in the bag member **92**A using an end mill, there is a low probability of the tip of the end mill reaching as far as the bag member **92**B positioned at the opposite side, so it is possible to form the opening part **92**H on one bag member **92**A side.

Subsequently, as shown in FIG. **7**B, in a state with the ink bag **80** having the supply port **81**K facing the antigravity direction Z side, ink from the formed opening part **92**H is injected into the ink chamber IS inside the bag body **91** (refilled). At this time, it is preferable to use a tool to make the injection work easy. Here, a funnel RT is used as a tool, and its thin tube side is inserted in the opening part **92**H. Also, when injecting ink, it is possible to pressurize the ink.

The opening part **92**H is formed at a position separated in relation to the welded part of the ring shaped rib **62***a* shown with shading provided so as to enclose the injection port **72** in which ink is injected during manufacturing of the ink cartridge **70**. Therefore, even if the bag member **92**A is deformed during ink injection work, having the adhered part of the ring shaped rib **62***a* peeled off so that the bag member **92**A is torn is suppressed.

Subsequently, as shown in FIG. **7**C, in a state with the ink bag **80** having the supply port **81**K facing the antigravity direction Z side, after injecting ink into the bag body **91** and refilling, by the collector adhering the designated sealing film **97** to the bag member **92**A using an adhesive agent or the like so as to cover the opening part **92**H, sealing is done so that ink does not leak from the opening part **92**H. Alternatively, it is also possible to seal the opening part **92**H by adhering a sealing material such as an adhesive agent or the like rather than the sealing film. Of course, it is preferable to seal the opening part **92**H in a state with the ink overflowing from the opening part **92**H so that gas (air) does not enter (does not remain) inside the ink chamber IS.

Returning to FIG. **6**, next, at step S**16**, the process of attaching the ink bag **80** to the second case member **72** is performed. Here, after the collector inserts the tube shaped flow path part **85** of the ink bag **80** in which ink has been injected again into a hole provided in the concave shaped part

75 of the second case member 72, the supply member 81 is rotated, and the tube shaped flow path part 85 is fixed and attached at the concave shaped part 75.

Subsequently, at step S17, the process of attaching the second case member 72 to the first case member 71 is performed while inserting the ink bag 80 inside the first case member 71. Here, the collector inserts the ink bag 80 from the opening area 71S into the first case member 71, and moves the second case member 72 by sliding to approach the first case member 71. By this sliding movement, by the projecting part 71F of the first case member 71 being fit into the hole part 72H of the second case member 72, the second case member 72 is attached to the first case member 71, and recycling processing of the ink cartridge 70 ends.

With the embodiment described above, it is possible to obtain the following effects.

(1) The opening part 92H for injecting ink inside the bag body 91 of the ink bag 80 during recycling is formed outside the area facing opposite the filter 66 with the bag body 91, so it is possible to recycle the ink bag 80 while suppressing damage to the filter 66 that the ink bag 80 has. Also, by having the ink bag 80 recycled while suppressing damage to the filter 66, it is possible to repeatedly supply ink from the same ink cartridge 70 to the printer 11.

(2) It is possible to easily confirm from the deformation situation of the bag member 92A the area of the bag body 91 for which it is possible to do opening formation of the opening part 92H outside the area overlapping the filter 66 in a state without ink housed, in other words, outside the area facing opposite the filter 66, so at step S13, it is possible to form the opening part 92H while suppressing damage to the filter 66 with high probability.

(3) It is easy to visually check the area for which an opening is possible outside the area facing opposite the filter 66 with the bag member 92A in a state with ink not housed inside the bag body 91. Therefore, at step S13, it is possible to easily form the opening part 92H on the bag member 92A while suppressing damage to the filter.

The embodiment noted above can also be modified to other embodiments such as those noted below.

With the recycling process of the ink cartridge 70 of the embodiment noted above, at step S13, it is also possible to form the opening part 92H on the bag member 92B not facing the filter 66.

As shown in FIG. 8, with this modification example, the opening part 92H is formed at the supply member 81 side end part in the ink chamber IS, which is an area that does not overlap with the connecting member 61. By doing this, when ink is injected with the supply port 81K at the antigravity direction Z side, there is a higher probability of being able to inject ink at a volume that will fill the inside of the ink chamber IS in a state without gas being included inside the ink chamber IS.

Alternatively, it is also possible to form the opening part 92H in the area overlapping the connecting member 61 (the film 69) inside the bag body 91. By doing this, when forming the opening part 92H using an end mill on the bag member 92B, it is possible to use the connecting member 61 to control so as not to have the tip of the end mill reach the filter 66 (filter chamber 60F).

With this modification example, in addition to the effects (1) and (2) of the embodiment noted above, the following effect is exhibited.

(4) At step S13, the opening part 92H is formed on the bag member 92B not facing the filter 66, so damage to the filter 66 accompanying opening formation is reliably suppressed.

With the embodiment noted above, the connecting member 61 which is also the filter member attached so as to be an integral unit with the supply member 81 is preferably equipped so as to be detachable with the supply member 81.

As shown as an example in FIGS. 9A and 9B, with this modification example, for example, on the supply member 81, a connecting part 82*a* having a roughly oval cross section pillar shape is formed projecting on the junction part 82. Also, a part to be connected 63 which is a hole similarly with a roughly oval shaped cross section is formed on the connecting member 61. Also, sandwiching the valve body 93 (non-return valve), the connecting part 82*a* of the supply member 81 is inserted in a state fit into the part to be connected 63 of the connecting member 61, and thus it is possible to attach the connecting member 61 to be an integral unit with the supply member 81. Meanwhile, in a state with the supply member 81 and the connecting member 61 as an integrated unit, for example, by pulling with a designated force so as to pull the connecting member 61 away from the supply member 81, it is possible to cut apart the supply member 81 and the connecting member 61.

Therefore, as shown in FIG. 10, by moving and changing at least one of the formation position of the connecting part 82*a* of the supply member 81 side and the formation position of the part to be connected 63 of the connecting member 61 side, it is possible to change the position of the connecting member 61 with the ink chamber IS inside the bag body 91 as shown by the broken line and double dot-dash line in FIG. 10. Specifically, it is possible to move the position of the filter 66 facing the bag member 92A inside the ink chamber IS.

For example, with the ink bag 80, when forming the opening part 92H at the antigravity direction Z side in a state mounted on the mounting unit 20, the connecting member 61 is moved to the gravity direction side shown by the dotted line in FIG. 10 such that the filter 66 separates from the opening part 92H. Also, even when forming the opening part 92H on the bag member 92B side as with the modification example noted above, including when forming the opening part 92H at a position overlapping the connecting member 61, it is preferable to move the connecting member 61 according to the position at which the opening part 92H is formed.

With this modification example, in addition to the effects (1) through (3) of the embodiment noted above and the effect (4) of the modification example noted above, the following effect is exhibited.

(5) With the bag body 91, it is possible to set the opening position outside the area facing opposite the filter 66 to a position suitable for injection of the ink.

With the embodiment noted above, when the formation position of the opening part 92H is not buffered with the second case member 72, it is acceptable to omit the processes of step S12 and step S16 shown in FIG. 6. In this case, the work load of the collector removing the ink bag 80 from the second case member 72, and the work load of attaching the ink bag 80 to the second case member 72 after formation of the opening part 92H is reduced.

With the embodiment noted above, the bag member 92A which is a sheet member does not absolutely have to have the sheet surface area be at a maximum in a state with ink not housed inside the bag body 91. For example, in a case such as when constituting the bag body 91 with a plurality of bag members of three or more, the bag member 92A facing (facing opposite) the filter 66 may have times when it has a smaller surface area than the other bag member (bag member 92B) in a state when ink

is not housed inside the bag body **91**. In such a case as well, it is possible to form the opening part **92**H on the bag member **92**A.

With the embodiment noted above, the filter **66** does not absolutely have to be arranged inside the bag body **91** in an orientation with the sheet surface in a direction along the sheet surface of the bag body **91** (bag member **92**A) in a state with ink not housed inside the bag body **91**. For example, the filter **66** can also be arranged in a direction crossing the sheet surface of the bag member **92**A.

In this case, the area in which the filter **66** and the bag body **91** face opposite each other is the area for which the filter **66** and the bag body **91** overlap seen from the perpendicular line direction of the sheet surface of the bag member **92**A. Or it is the area for which the filter **66** and the bag body **91** overlap seen from the perpendicular line direction of the sheet surface of the filter **66**. Alternatively, it is both of these.

With the embodiment noted above, the bag body **91** does not absolutely have to be a sheet member. For example, it can also be a plate member with little deformation. In this case, regardless of whether or not the ink is housed inside the bag body **91**, the area in which the filter **66** and the bag body **91** face opposite each other is the area for which the filter **66** and the bag body **91** overlap seen from the perpendicular direction of the sheet surface of the filter **66**.

With the embodiment noted above, when forming the opening part **92**H on the bag member **92**A, as long as it is at a position for which it does not overlap the first opening **65** of the filter chamber **60**F, the opening part **92**H can be formed at a position that overlaps the connecting member **61**. With this method, the ink bag **80** can maintain the function of the filter chamber **60**F even if the filter **66** is damaged, and it is possible to suppress the formation of the opening part **92**H simultaneously on the bag member **92**B by the interposed connecting member **61**.

With the embodiment noted above, though omitted from the drawing, the opening part **92**H can be formed at the side opposite to the supply member **81** in the ink chamber IS. For example, when it is not necessary to inject ink with the supply port **81**K on the antigravity direction Z side without ink leaking from the supply port **81**K, it is possible to form the opening part **92**H in this way.

With the embodiment noted above, the bag body **91** can also be formed with a plurality of bag members of three or more. For example, it is also possible to form it with four bag members with two bag members added as the gusset part that connects between the bag member **92**A and the bag member **92**B. In this case, the bag member **92**A functions as the first sheet member, and the other bag members function as the second sheet members.

With the embodiment noted above, it is not absolutely necessary to form the de-aerating chamber **60**D. When there is a low probability of gas being contained in the ink, the de-aerating chamber **60**D is not necessary. In this case, for example, it is not necessary to provide the second recess area **67** in the connecting member **61**. Alternatively, the de-aerating chamber **60**D can also have a constitution such that even if the second recess area **67** is provided, the film **69** is not adhered at the second opening **68**.

With the ink cartridge **70** of the embodiment noted above, it is not absolutely necessary to equip the electrical connection part **30**. Also, the circuit substrate as the electrical connection part **30** does not absolutely have to be inclined in the insertion direction Yr to the mounting unit **20**. For example, it is also possible to use the direction orthogonal to the insertion direction Yr.

With the embodiment noted above, the mounting unit **20** can also have a constitution equipped on the outside of the case **11***a* of the printer **11**. When supplying ink to the liquid spray head **18** on the interior of the case **11***a* from the mounting unit **20** provided on the outside of the case **11***a*, it is necessary to lead the ink supply tube TB for supplying ink from the outside of the case **11***a* to the inside. Thus, in this case, it is preferable to provide a hole or notch in the case **11***a* in which the ink supply tube TB can be inserted. Alternatively, it is also possible to lead the ink supply tube TB through the gap provided in the case **11***a* from outside to inside the case **11***a*. By doing this, it is possible to easily perform supplying of ink to the liquid spray head **18** using the ink flow path of the ink supply tube TB.

The liquid spray head **18** is not limited to being a so-called serial head type that sprays ink by moving back and forth together with the carriage **16** in the direction crossing the conveyance direction of the paper P. Specifically, it has an overall shape for which the length size corresponds to the width size of the paper P, and in a state with the lengthwise direction fixed and arranged to go along the width direction that crosses the conveyance direction Y of the paper P, it is also possible to have an item of a so-called line head type that sprays liquid toward the medium from a plurality of nozzles provided so as to extend across roughly the entirety in the lengthwise direction.

With the embodiment noted above, the printer **11** can also be a liquid consuming device that sprays or discharges liquid other than ink. The state of the liquid discharged as tiny droplets from the liquid consuming device includes granular shapes, tear shapes, and threadlike shapes with a tail. What is referred to here as a liquid is acceptable as long as it is a material that can be sprayed by the printing device. For example, a substance when it is in a liquid state such as liquid state materials of high or low viscosity, as well as fluid bodies such as sol, gel water, other inorganic solvents, organic solvents, solutions, liquid resin, liquid metal (metal melt), and the like are included. Also, this is not limited to liquids as one physical property state, but items for which particles of functional materials consisting of a solid such as a pigment, metal particles or the like are dissolved, dispersed, or blended in a solvent and the like are also included. Representative examples of liquid or liquid body printing materials include the kind of ink like that described with the embodiments noted above, liquid crystal and the like. Here, ink includes various types of liquid body compositions such as typical water based inks and oil based inks as well as gel inks, hot melt inks and the like. As a specific example of a liquid consuming device, for example, there are liquid consuming devices which spray liquid including materials such as electrode materials or coloring materials or the like in a dispersed or dissolved form used in manufacturing items such as liquid crystal displays, EL (electro luminescence) displays, surface light emitting displays, color filters and the like. It is also possible to be a liquid consuming device for spraying bioorganic material used for biochip manufacturing, a liquid consuming device for spraying a liquid that will be a sample used for a precision pipette, a textile printing device, a micro dispenser or the like. Furthermore, it is also possible to use a liquid consuming device for spraying lubricating oil with a pinpoint on

precision machines such as watches, cameras or the like, or a liquid consuming device for spraying a transparent resin liquid such a ultraviolet curing resin or the like for forming a miniature hemispheric lens (optical lens) used for optical communication elements or the like on a substrate. It can also be a liquid consuming device for spraying an acid or alkaline or the like etching fluid for etching a substrate or the like.

GENERAL INTERPRETATION OF TERMS

In understanding the scope of the present invention, the term "comprising" and its derivatives, as used herein, are intended to be open ended terms that specify the presence of the stated features, elements, components, groups, integers, and/or steps, but do not exclude the presence of other unstated features, elements, components, groups, integers and/or steps. The foregoing also applies to words having similar meanings such as the terms, "including", "having" and their derivatives. Also, the terms "part," "section," "portion," "member" or "element" when used in the singular can have the dual meaning of a single part or a plurality of parts. Finally, terms of degree such as "substantially", "about" and "approximately" as used herein mean a reasonable amount of deviation of the modified term such that the end result is not significantly changed. For example, these terms can be construed as including a deviation of at least t 5% of the modified term if this deviation would not negate the meaning of the word it modifies.

While only a selected embodiment has been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. Furthermore, the foregoing descriptions of the embodiment according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

What is claimed is:

1. A liquid housing body recycling method for a liquid housing body that includes a liquid housing unit that is configured to house liquid, a supply member with a supply port that is configured to be connected to a liquid supply tube of a liquid consuming device, and a filter through which the liquid is configured to pass, the liquid housing unit being formed of a flexible sheet member, with the liquid inside the liquid housing unit being supplied to the liquid consuming device via the supply port by passing through the filter,

the liquid housing body recycling method comprising:

forming an opening part on the sheet member at a position outside an area facing opposite the filter on the liquid housing unit;

injecting the liquid from the opening part of the sheet member on which the opening part has been formed; and

sealing the opening part.

2. The liquid housing body recycling method according to claim **1**, wherein

the filter is in sheet form, and in a state with the liquid not housed inside the liquid housing unit, a sheet surface of the filter is arranged inside the liquid housing unit in an orientation extending along a sheet surface of the liquid housing unit.

3. The liquid housing body recycling method according to claim **2**, wherein

the liquid housing body further includes a filter member to which the filter is adhered on one surface side and is disposed inside the liquid housing unit,

the liquid housing unit has a first sheet member facing the filter adhered to the filter member, and a second sheet member that does not face the filter, and

the first sheet member is arranged in parallel to the filter in a state with the liquid not housed inside the liquid housing unit.

4. The liquid housing body recycling method according to claim **3**, wherein

the forming of the opening part includes forming the opening part on the second sheet member.

5. The liquid housing body recycling method according to claim **3**, wherein

the filter member is detachably attached to the supply member.

6. A liquid housing container comprising:

a case member; and

a liquid housing body disposed inside the case member, the liquid housing body being recycled by the liquid housing body recycling method according to claim **1**.

* * * * *